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## KOREAN PATENT ABSTRACTS

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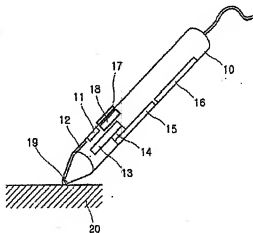
(54) OPTICAL MOUSE

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(57) Abstract:

**PURPOSE:** An optical mouse is provided to operate a mouse without a mouse pad by transmitting an irradiated light from a luminescence measure through a light guide to a bottom surface at low angle and preventing the light from being spread into the around, thereby enlarging a reflection light.

**CONSTITUTION:** A mouse body(10) has a shape for being grasped by the hand. A pressure sensor(19) perceives a pressure when the end surface of the mouse body is contacted to a predetermined contacting surface. An illumination device(11) radiates the internal light when the pressure sensor(19) perceives a pressure. A light guide(12) irradiates the irradiated light from the illumination device(11) at the bottom surface in an angle. A phase opening unit(13) phases a reflection generated by reflection of the irradiated light through the light guide(12) and outputs the light to an image sensor(14). The image sensor(14) senses a phased light and converts an electric signal and sends the signal to a control unit(15). A transmission unit(16) calculates the coordinate value of a cursor displayed on a monitor in accordance with a light signal and converting value sensed at the control unit. The coordinate value and a setting signal of all sorts of functions are sent a control unit located in a computer main body.



## Patent Application

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Postal code or zip code	Secure Information
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④ Request for an Examination	Demand.
④ Earlier Publication	Petition
④ Purport	

We file an application under Article 42 of Patent Act, file a Request for Examination under Article 60 of the same Act, and request the present application to be published under Article 84 of the same Act. Agent Yeong-Pil Lee (Signature) Agent Heung-Su Choi (Signature) Agent Hae-Yeong Lee (Signature)

④ Official Fee

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⑤ Attached Documents

1. The document 1 contains 3 letter of attorney. 1 container proving the summary - specification (drawing) 1 container 2 small entity.

## Patent Specification

### Abstract

The present invention relates with optical mouse apparatus. By taking advantage of the reflection light, it is done by a feature as to the optical mouse apparatus the present invention detects to move and for indicating the location of a cursor on the computer monitor of a mouse to include the lighting device irradiating the light, the light guide which guides the light in order to irradiate the light irradiated from the lighting device while being controlled the angle, the image sensor, the imaging system, the control means, and the transmission mean transmitting the coordinate calculated in the control means with the computer main body. As to the light guide which guides the light in order to irradiate the light irradiated from the, the leading end and floor side of the mouse device are fixed. The image sensor senses the light which is income while being positioned in the optical mouse lens side and converted into the electric signal. The imaging system accumulates the light which is irradiated in the light guide as the floor side and is reflected and changing the pathway of the irradiated light as described above and authorized in the image sensor. The control means controls so that the light be irradiated in the lighting device, and calculates the coordinate of the cursor displayed on the computer monitor by using the electric signal transformed from the image sensor.

According to the present invention, it has the effect that it reduces since the irradiated light being delivered to the floor side from the lighting device through the light guide to the low angle and the route of the reflection light collected strictly through the photo route modification means and the effect that it nearly normally can activate from all floor sides without the separate mouse pad being perpendicularly clamped converted and setting up the sticking location of the image sensor in the optical mouse apparatus inner part of the main body side to be thick of the optical mouse apparatus and it can compact.

⑥ Representative Drawing

Drawing 3

### The Title of Invention

Light mouse device(Light mouse device)

### Brief Description of the Drawings

Figure 1 is a configuration diagram of the optical mouse apparatus utilizing the conventional complementary metal oxide semiconductor sensor.

Figure 2 is a drawing showing the process where the light radiated from the lighting device at the optical mouse apparatus utilizing the conventional complementary metal oxide semiconductor sensor is incident in the floor side.

Figure 3 is a perspective view of the optical mouse apparatus according to the present invention.

Figure 4 is a drawing showing an example of the internal configuration of the optical mouse apparatus.

Figure 5 is a drawing showing the internal configuration of the optical mouse apparatus, and, the other one example.

Figure 6 is a flowchart for illustrating the operation of the optical mouse apparatus.

Figure 7 is a drawing showing an example of the light emitting means of the optical mouse apparatus.

Figure 8 is a drawing showing an example of the light guide of the optical mouse apparatus.

Figure 9 is a drawing showing the process where the light radiated from the lighting device is incident in the floor side in the optical mouse apparatus.

### The Detailed Description of Invention

#### The Purpose of Invention

⑦ Field of Invention and the Prior Art

The present invention relates to the mouse for computer, particularly, to the optical mouse apparatus in which the light irradiated from the lighting device is income to the fixed angle in the floor side with the light guide, and changing the pathway of the light reflected in the floor side and which becomes in the image sensor.

It is comprised of a ball and the function setting button in which the coordinate obtain is possible as the computer peripherals which indicates a location by using the cursor displayed on the conventional mouse for computer is the display device in the computer system.

But the conventional ball type mouse as described above the separate pad for a ball and the smooth rotation to a need. Moreover, the coordinate axis which is operated according to the rotation of a ball although it operates on the mouse pad is not accurately rotated and it has the problem of the cursor of an on-screen that it is unable to be soft to move. And there is a problem that the click button equipped in the mouse shear has to be manipulated in the state clenching a mouse and moves. A speed and accuracy of a coordinate are dropped down in this case, even when the operation for the movement of a mouse is troublesome. Particularly, as to the ball type mouse, the dust etc. could be caught between the between devices which sensed a ball and rotation since using the rotation of a ball and a durability was not elementarily, primarily high. And a durability had to be inconvenient.

Moreover, there can be a problem as to the optical mouse apparatus, which the mouse in which the optical sensor and pad united and the optical mouse employing the complementary metal oxide semiconductor sensor were used, used the optical sensor and pad the mouse pad for the coordinate detecting measure consisting of the emitting device and light receiving element and optical mouse apparatus was formed with the line pattern, because it certainly has to have the exclusive pad, in the optical mouse apparatus, the use of mouse range is therefore restrictive as the optical mouse apparatus for using the method for detecting a coordinate by using the light in mouse for computers.

In the meantime, recently, at the same time, it had the advantage that the separate pad was unnecessary to the existing optical mouse apparatus and the advantage that a durability was high because of noted using the apparatus in case of the optical mouse employing the developed complementary metal oxide semiconductor sensor. But there can be the problem that it is difficult to the coordinate transfer exact since being the form holding and moves be difficult and perform the elaborate graphic work or the autograph work utilizing a mouse as mice is the hand.

In the elaborate graphic work as described above or the autograph work, in order to perform the accurate cursor control utilizing a mouse, the pen type mouse is



The transmission mean (16) calculates the coordinate of the cursor displayed based on the conversion value on a monitor and the optical signal sensed in the control means (15). Moreover, the set signal of the various kinds function and the coordinate calculated in the control means (15) is provided through the mouse port to the control means of the computer inner part of the main body. The set button (17) and the switch (18) bending are function buttons for performing the predetermined task through the control means (15) on a monitor. Of course, as to the transmission mean (16), wireless and wired transmission can do all.

In fig. 4, the same reference numeral is used the same part as fig. 3.

Since being identical of the thing which the operation of the control means (15) and lighting device (11), light guide (12), imaging system (13), image sensor (14) illustrates in fig. 3, it decides to omit the description.

As to the back mirror or the perpendicular prism 13(b), it is installed on the route of the light passing through the imaging lens. It back changes the pathway of the light of Sub-A with 90°, and the light is applied in the image sensor 14 and it is accurately imaged.

Figure 5 is a drawing showing the internal configuration of the optical mouse apparatus, and, the other one example.

As to the apparatus of fig. 5, it is different in the structure of the apparatus of fig. 4 and imaging system and test elements: the pentaprism (13c) is instead of equipped to the photo route modification means of the imaging system (13) with the back mirror or the perpendicular prism (13b).

And in case of using the pentaprism (13c) as the photo route modification means, since a coordinate and direction of the cursor in which the coordinate of a phase coordinate with a coordinate calculated as the mobile direction of a mouse in the coordinate calculation.

Figure 6 is a flowchart for illustrating the operation of the optical mouse apparatus.

pressure sensor (19) of the optical mouse apparatus feeding and senses the contact pressure, also over

As shown in Fig. 3, the fabric design (11) is comprised of the PCB substrate (11b) of a circular or an ellipse, and a

the reflection light imaged in the image sensor (14) through the imaging system (13) is respected to do and a plurality of light emitting diodes (11) is

emitting means (11a) with the signal sensed in the pressure sensor (19) of the mouse shear or it blocks and the radiation of the light is controlled and with a

that the light emitted from the light emitter means (11a) of the lighting device (11) is irradiated in the floor side while passing through the light guide (12).

Referring to Figure 8, the light guide (12) provides the convex lens (

light passes the optical waveguide (120) of the light guide (12). At this time, it tries to prevent from the light passing out from the optical waveguide (120). Therefore, the optical waveguide (120) is satisfied the total reflection condition about the progress light. Moreover, as shown in Figure 7, the slant reflecting surface is set up with

(12) circulated and is illuminated, at the same time, it uniformly illuminates in the floor side.

Referring to Figure 9, the reason for maintaining the angle  $\theta$  in which the light coming from the light guide (12) brightens the floor side with the set angle is that the light (2) enters the side in which the color is uniform and the side does not have a pattern like the copying paper. If such floor side

side (21) illustrated in Figure 9 exists in fact. Therefore, in case the angle of incidence of the light which is irradiated from the lighting device (17) and is directed towards the side (21) is smaller than the critical angle (about usually:  $16^{\circ}$ - $25^{\circ}$ ) not like that shown in fig. 2, the light is believed in the left side inclined

of the unevenness part. However, the light is not believed in the right slope (23) of the unevenness part and an image of the floor side sensed by the image sensor (14) through the imaging system (13) the left of the unevenness part, and the right slope is observed through

image having the different brightness, that is, a pattern

unevenness part and height. However, 25° or less is proper in consideration of the interval of the concavo-convex of the normal foot (Fig. 12), and the high concavo-convex covers and an image is effectively effectively formed by the high concavo-convex, while the efficiency of the

illumination drops in case an angle is so low it moreover, a constant  $\frac{1}{2}$  is added to the

... a route is trans-

reflection light and is installed and it is imaged to the store (the spot in which an image is clearly put up) in the image sensor (14) adhered to the mouse body

Of course, as to the photo route modification means, the other means can be used besides the back mirror described in the above of the perpendicular prism.

Stage, right and left of an image have been reversed and reading a coordinate from a direction and the opposite direction in which a mouse moves, in case of using

case of using the pentaprisim (13c) illustrated in Figure 5, since the coordinate of a phase does not change, a coordinate is calculated as the mobile direction of the

pentaprism (13c) the size of the optical mouse apparatus can be miniaturized.

(13a) and image sensor (14) have to be nearly the same as that. And this distance has to set up so that two times of the total distance of the imaging lens (13) and image sensor (14) have to be nearly the same as that. And this distance has to set up so that two times of the total distance of the imaging lens (13) which is bigger than

or, since the translation distance acknowledged with the actual movement distance of the optical mouse apparatus and image sensor (14) and camera module (15) is not the same, the order precision of a mouse is degraded or it is non-efficient. However, in case of performing the marked precision operation

utilizing a mouse, the magnification need to be artificially lowered. The apparatus for this, for using the zoom lens or adjusting a distance between the optic route between the floor side and the imaging lens (13a) and imaging lens (13a) and image sensor (14) can be added.

The spherical surface lens of the normal manufactured to the optical glass can be used as the imaging lens (13a) of the optical mouse apparatus. And the plastic injection lens having the spherical surface for the miniaturization of the optical mouse apparatus and light weight can be used. If the aspheric convex lens is used, because of lowering the value of the imaging system (13), it is small, the length of the mouse device is manufactured. And the weight is reduced in comparison with the glass lens. The subordinate who the hand holds away can be decreased in a manually and the operation of the optical mouse apparatus can be more easily implemented. Particularly, the imaging lens (13a) of the local distance which is long in comparison with the conventional optical mouse apparatus of the imaging system (13) is used. Therefore, the depth of focus of the imaging system (13) is deep and the optical mouse apparatus normally can operate about the floor side having under a mirror-face. And the optical mouse apparatus can not contact in the surface and the operation which is a little bit normal even in case of having in the upper part can be done.

And in case the optical mouse apparatus is actually used, at this time, it is looks at the side of the imaging system (13) to a little bit concentrate rather than the optical mouse apparatus be perpendicularly plumb made stand in the surface and use and, the ladder aberration (trapezoidal aberration) can be generated. It is preferable that if this aberration is generated, the problem of differently sensing the translation distance occurs according to the traveling direction of the optical mouse apparatus, or an operation can be disturbed. Therefore, the imaging lens (13) uses that the ladder aberration is minimized.

Next, it is changed with the image sensor (14) to the signal which is an electrical and the imaged image of the floor side is transmitted to the control means (15) with the imaging system (13) consisting of the imaging lens (13a) and photo route modification means. (208 step)

As shown in fig. 4 or 5, the image sensor (14) can set up in the optical mouse apparatus inner part of the main body side by changing the optical path with the photo route modification means of the imaging system (13). Therefore, since the length of the image sensor (14) can set up in the inner part of the main body anywhere of the mouse device although the length is bigger than the diameter of the optical mouse apparatus, it reduces to be thick at the optical mouse apparatus and it can comprise.

The control means (15) moves of a mouse by using the electric signal, if  $x$  transformed  $X$  transmit through the transmission mean (16) with a computer after calculating that is, the traveling direction and  $X$ , and  $Y$  coordinate value, it indicates a computer with the position displayed on a monitor to move. (210 step)

The principles that the image sensor (14) and control means (15) recognize the traveling direction and distance of the optical mouse apparatus according to move of the optical mouse apparatus are as follows.

Generally the optical mouse apparatus successively accepts the image of the floor side (21) of every second 1500 long precision through the imaging system (13). And it is interior comprised of the image of the floor side (21) described in the above of  $18 \times 18$  pixel. In case of observing the floor side (21) in which it has the specific pattern (the need to be certainly a pattern does not have. And the part in which the scratch or the color is changed has no relation) through a mouse, the observed part corresponding to the specific pattern within an image exists. Therefore, if the optical mouse apparatus is moved, the location of the specific pattern part will move from the observed image to each hourly proportionally to the mouse movement direction and speed. Therefore, it determines whether the specific pattern part moved to a direction, or not the traveling direction and translation distance of the optical mouse apparatus can be recognized clearly.

Next, after moving the optical mouse apparatus a user moves a cursor in the desired location, a user presses the set button (17) mounted on the pan part and a user selects an icon on the monitor screen or the program etc. or a user can enforce. (212 step)

The set button (17) and the switch (18) bending are operated to the same mode as the click system of the normal mouse. Therefore, by using the set button (17) or the switch (18) bending, the sentence of the icon or the word processor program or the letter can be selected. For example, if it is positioned in an icon etc., a cursor desires the operation of the etc. pressing one button and executes the program is performed. And it presses a button and it makes not stay enough and the other one performs functions which are in a menu. Moreover, by utilizing the wheel switch positioned at the upper portion, a scan can be adjusted as top and bottom.

It is sure that the present invention is not restricted to the above-described embodiment. And the deformation by the person skilled in the art is possible in the range that does not mar the technical of the present invention. Therefore, in the present invention, the claims the right range is not determined within the range of the detailed description but the range that will be limited to the claims which will be described later.

#### Effect of Invention Device

According to the present invention, the optical mouse apparatus for including the light guide and optical path means etc has the effect as follows.

There can be the advantage it nearly normally can operate in all floor sides by doing the reflection light which is not diffused to a neighboring and in which the light is reflected while delivering to the low angle, and of operating a mouse without the separate mouse pad as the floor side the light irradiated through the light guide from the light emitting means with first.

Since the route of the reflection light collected strictly through the photo route modification means being perpendicularly plumb converted and setting up the sticking location of the image sensor in the optical mouse apparatus inner part of the main body side, the diameter of the optical mouse apparatus can be formed into the extent which is a little bit bigger than the diameter of the lens regardless of the size of the image sensor, it reduces while the facilitate size to hold in the hand to be thick of the optical mouse apparatus and the extent can comprise with second.

The zoom lens is usually instead of used with imaging lens, or the function of controlling the arrangement of the imaging system is imposed. In that way while controlling the action precision of a mouse, the variability which is suitable for the high accuracy task can be given with third.

#### Claim [1]

The optical mouse apparatus of the optical mouse apparatus it detects to move and for indicating the location of a cursor on the computer monitor of a mouse the reflection light is taken advantage of, wherein: the lighting device irradiating the light, the light guide which guides the light in order to irradiate the light irradiated from the lighting device while being comprised the angle, the image sensor, the imaging system, the control means, and the transmission mean transmitting the coordinate calculated in the control means with the computer main body are included: as to the light guide which guides the light in order to irradiate the light irradiated from the lighting device and floor side of the mouse device are in the image sensor across the light which is incoming while being positioned in the optical mouse apparatus inner side and converted into the electric signal; the imaging system accumulates the light which is irradiated in the light guide as the floor side and is reflected; and it changes the pathway of the integrated light as described above and it utilizes in the image sensor; and the control means controls so that the light be irradiated in the lighting device; and calculates the coordinate of the cursor displayed on the computer monitor by using the electric signal transformed from the image sensor.

#### Claim [2]

The optical mouse apparatus of claim 1, wherein the lighting device includes an plurality of light emitting means installed in the regular interval on the PCB substrate of the circular in which a center is vacant of the ellipse and the wires supplying the power to a substrate.

#### Claim [3]

The optical mouse apparatus of claim 1, wherein the light guide includes the convex lens focusing the light irradiated in the lighting device on the parallel light form, and the optical waveguide proceeding the light including the reflecting surface, and the optical waveguide proceeding the light including the reflecting surface is the light focused with the convex lens irradiated in the floor side as an angle less than  $40^\circ$ .

#### Claim [4]

The optical mouse apparatus of claim 3, wherein the optical waveguide comprises the reflecting surface which is the light focused with the convex lens irradiated in the floor

side as the angle of 15° or 25°.

● Claim [5]

The optical mouse apparatus of claim 3, wherein the light guide is the light progressed through the optical waveguide circumscribed and it more includes the concave lens irradiates in the floor side.

● Claim [6]

The optical mouse apparatus of claim 1, wherein the imaging system is irradiated in the floor side and it includes the imaging lens imaging the reflected reflection light, and the photo route modification means, and the photo route modification means changes the pathway of the imaged light as described above and authorized to the image sensor.

● Claim [7]

The optical mouse apparatus for having the aspherical lens as a feature of claim 6, wherein the imaging lens corrects the ladder aberration.

● Claim [8]

The optical mouse apparatus of claim 6, wherein the imaging lens is the zoom lens, or it more includes the apparatus for adjusting a distance between the optic route between the floor side and the imaging lens end imaging lens and image sensor.

● Claim [9]

The optical mouse apparatus of claim 6, wherein the photo route modification means has one as a feature among the back mirror, and the perpendicular prism and pentaprism.

● Claim [10]

The optical mouse apparatus of the optical mouse apparatus it detects to move and for indicating the location of a cursor on the computer monitor of a mouse the reflection light is taken advantage of, wherein: the lighting device irradiating the light, the image sensor, the imaging system, the control means, and the transmission mean transmitting the coordinate calculated in the control means with the computer main body are included; the image sensor senses the light which is income while being positioned in the optical mouse inner side and converted into the electric signal; the imaging system accumulates the light which is irradiated in the lighting device as the floor side and is reflected and changing the pathway of the integrated light as described above and authorized in the image sensor; and the control means controls so that the light be irradiated in the lighting device; and calculates the coordinate of the cursor displayed on the computer monitor by using the electric signal transformed from the image sensor.

● Claim [11]

The optical mouse apparatus of the optical mouse apparatus it detects to move and for indicating the location of a cursor on the computer monitor of a mouse the reflection light is taken advantage of, wherein: the lighting device irradiating the light, the light guide which guides the light in order to irradiate the light irradiated from the lighting device while being comprised the angle, the imaging system, the image sensor, the control means, and the transmission mean transmitting the coordinate calculated in the control means with the computer main body are included; as to the light guide which guides the light in order to irradiate the light irradiated from the, the leading end and floor side of the mouse device are fixed; the imaging system accumulates the light which is irradiated in the light guide as the floor side and is reflected and authorized in the image sensor; the image sensor senses the light applied in the imaging system and converted into the electric signal; and the control means controls so that the light be irradiated in the lighting device; and calculates the coordinate of the cursor displayed on the computer monitor by using the electric signal transformed from the image sensor.

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Drawing(s)



